On the Mortality *of* London Hospitals: *and* Incidentally *on the* Deaths *in the* Prisons *and* Public Institutions *of the* Metropolis. *By* William A. Guy, M.B., F.R.S., F.R.C.P., *Professor of Forensic Medicine, King's College, London; Physician to King's College Hospital, &c.*

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At a meeting of the *Congrès de Bienfaisance*, held in London in the year 1862, I read a short paper "On the Rate of Mortality prevailing in the General Hospitals of London," based upon the returns made to the Council of this Society in the previous year.* The returns for five years are now published in the pages of our *Journal*; and I hope to be able to deduce from them some results which may prove instructive to medical men, and not uninteresting to the members of other professions.

The returns in question have supplied the materials for the following summary:—

1.—*Results of all the Returns from Thirteen General Hospitals for any, or all, of the Five Years* 1861-65.

	Admissions.	Deaths.	Deaths per 1,000.
Medical cases	52,819	7,657	145
Surgical „	78,142	5,074	65
All „	143,245	13,898	97
Males	57,696	6,074	105
Females	40,524	3,480	86
Males, medical cases	18,586	3,231	174
Females, „	17,747	2,003	113
Males, surgical cases	35,230	2,489	71
Females, „	19,536	1,198	61
Special wards	9,165	135	15
Medical cases, highest mortality in any hospital in any year			196
„ lowest „ „			104
Surgical cases, highest mortality in any hospital in any year			102
„ lowest „ „			53
All cases, highest mortality in any hospital in any year			151
„ lowest „ „			76
			Days.
Mean residence, medical cases (36 returns)			28
„ surgical „ („)			32
„ all „ (43 „)			30

* For an account of the circumstances under which these returns were set on foot, see *Journal of the Statistical Society*, vol. xxv (1862), p. 384.

2.—*Results of Complete Returns from Six General Hospitals (St. Bartholomew's, Guy's, London, St. George's, King's College, and St. Mary's) for the Five Years* 1861-65.

	Admissions.	Deaths.	Deaths per 1,000.
Medical cases	43,445	6,437	148
Surgical ,,	65,385	4,239	65
All ,,	108,830	10,676	98
Medical cases, highest mortality in the sum of the six hospitals in any year			160
,, lowest mortality in the sum of the six hospitals in any year			140
Surgical cases, highest mortality in the sum of the six hospitals in any year			69
,, lowest mortality in the sum of the six hospitals in any year			62
All cases, highest mortality in the sum of the six hospitals in any year			105
,, lowest mortality in the sum of the six hospitals in any year			95

3.—*Results of Complete Returns of Mean Residence in Five General Hospitals (St. Bartholomew's, Guy's, London, St. George's, and St. Mary's).*

	Days.
Medical cases, longest mean residence	36
,, shortest ,,	24
,, mean residence	30
Surgical cases, longest mean residence	50
,, shortest ,,	26
,, mean residence	34
All cases, longest mean residence	40
,, shortest ,,	26
,, mean residence	32

My object in the paper just referred to, was to show "the "necessity of using great caution and circumspection when we "compare one hospital with another hospital situate within the "limits of the same capital city;" and "a like caution in comparing "the hospitals of one country, or of one capital city, with those of "another." In aiming at this object, I established incidentally the little influence of size or site, and of large or small pecuniary resources, on the rate of mortality; and I showed that equal figures might result "from unequal and wholly dissimilar combinations of "causes." I also expressed my conviction that, within the limits "of the same capital city, the mortality of hospitals is mainly due

to causes which determine the nature and severity of the cases admitted within their walls.

I must dwell for a short time on these statements of fact and opinion.

As illustration of the *fact*, take the returns for 1861 from the three hospitals which border one great line of thoroughfare from east to west—London and St. George's at the two extremities, Charing Cross in the interval—the first two of large size and in open situations, the last comparatively small, and joined to neighbouring buildings: London Hospital largely supplied with surgical cases from the docks and river, the other two more sparingly supplied with this class of cases: London Hospital contrasting strongly with St. George's, and in a less degree with Charing Cross, in the character of the surrounding population. And yet, in 1861, the death-rate of the three hospitals, taken in order from east to west, is 84, 83, and 83 per 1,000! As a second illustration, take the two large, richly endowed hospitals of St. Bartholomew's and Guy's, and the two smaller unendowed hospitals, University and King's, with so many contrasts of site, structure, and arrangement, external and internal; and yet, after a necessary correction for special wards, a rate of mortality (for the same year, 1861), approximating as the numbers 110, 112, 113, 115 in the 1,000, for King's, Bartholomew's, Guy's, and University respectively!

As giving some countenance to the *opinion* just expressed, take again these last figures (ranging from 110 to 115 in the 1,000), as the death-rates of the four hospitals having the largest medical schools, and, therefore, the greatest motives and aids to the supply of severe cases, and compare them with the figures first named (ranging from 83 to 84 per 1,000), as belonging to a class of smaller medical schools; or, as more convincing still, take the death-rate of 80 per 1,000 prevailing, during the five years 1840-44, in the recently established, old, dilapidated King's College Hospital, compared with the greatly augmented rate of 109 per 1,000 for the five years 1857-61, in the new and spacious hospital built on the same site, opened out by the removal of some very offensive nuisances, with greatly improved nursing arrangements, and medical staff little changed; but with all the motives and aids to the multiplication of severe cases augmenting with the lapse of time.

From this brief reference to my paper of 1862, based on the figures of the previous year, I pass to the five years 1861-65, and inquire, first, whether the coincidence of equal, or nearly equal, figures with unequal and dissimilar conditions, displays itself also in the last four years of the series. The answer is in the affirmative: for, in 1862, Guy's and St. Mary's have the same death-rate of 96 in the 1,000, while Westminster and King's differ only as the

numbers 101 and 103; in 1863, Guy's has a death-rate of 97, St. Mary's of 98; in 1864, London and Westminster differ as the numbers 105 and 106; in 1865, the death-rates of Westminster and Guy's are as the numbers 92 and 94; lastly, on the average of the five years, London and St. George's present the same mortality of 88, St. Thomas's and St. Mary's of 103 per 1,000.

I now proceed to justify by facts the opinion I have just expressed, that *within the limits of the same capital city, the mortality of hospitals is mainly due to the causes which determine the nature and severity of the cases admitted.*

Now there is one cause of variation in the population of hospitals which is too obvious to be overlooked by any thoughtful person: I mean *the proportion of medical and surgical cases.* In the paper already referred to, I stated that, for 1861, the hospital death-rate which, for all cases, ranged from 60 to 112 per 1,000, and averaged 95, for medical cases ranged from 77 to 187, average 140; and, for surgical cases, from 48 to 85, average 63. With such a contrast between medical and surgical cases, we have only to suppose two hospitals, either through the natural selection due to their respective neighbouring populations, or through the more artificial preference of one class of patients to the other, supplied, the one with an excess of medical, the other of surgical, cases, in order to value at their true worth the figures which embody the gross mortality of the two.

I purposely make choice of an extreme case, by way of illustration; and take the death-rates of King's College and the Royal Free Hospitals for the four years, 1861, 1863, 1864, and 1865.

In these four years 5,708 patients were admitted into the wards of King's College Hospital (exclusive of the lying-in wards), and of these 3,145 were medical, and 2,563 surgical, cases; while 5,254 patients entered the wards of the Royal Free Hospital, of which 1,265 were medical, and 3,989 surgical. So that out of 1,000 patients in King's College Hospital, 550 would be medical cases; while of the like number in the Royal Free Hospital, only 240 would be medical cases. Now the rate of mortality among medical cases is, as I have just shown, more than twice as high as among surgical cases. In this particular case, 162 per 1,000 represents the medical death-rate at King's College Hospital, and 80 per 1,000 the surgical death-rate; while 141 per 1,000, and 49 per 1,000 represent the medical and surgical death-rates of the Royal Free Hospital. In the one the medical death-rate is more than twice, in the other not much less than three times, as great as the surgical. If now, on the strength of the higher death-rate of King's College Hospital, which is 125 per 1,000 for all cases, compared with the more moderate rate of 71 per 1,000 prevailing at the Royal Free Hospital,

it were rashly inferred that King's College Hospital was less healthy, or the patients less skilfully treated, or worse nursed, attention would have to be drawn, in the first place, to its very high proportion of medical cases; and the distribution of cases, medical and surgical, in the two hospitals would have to be equalised. This may be done by supposing for each hospital a population of 500 medical and 500 surgical cases, subject each to the ascertained medical and surgical death-rate. I make this corrective calculation, and find the following results:—

	Per 1,000.
King's College Hospital, gross death-rate	125
Royal Free „ „	71
King's College, 500 medical and 500 surgical cases	121
Royal Free, „ „	95

So that the disparity which was represented by 125—71 deaths, has shrunk to the more moderate dimensions of 121—95 deaths, or from 54 deaths to 26 deaths, being less than half the number.

I will take one other case in illustration. In the five years 1861-65, there were admitted into St. George's Hospital 18,887 cases, out of which number there were 1,656 deaths, or at the rate of 88 per 1,000. In the same five years 21,252 patients were admitted into the London Hospital, of whom 1,878 died, being in the same proportion of 88 per 1,000. Now, let us see how this equal death-rate fares when the medical and surgical cases are equally distributed (500 medical and 500 surgical). The medical death-rate of St. George's was 123 per 1,000, of the London 127 per 1,000; the surgical death-rate was 60 per 1,000 at St. George's, and 72 per 1,000 at the London. The death-rates, therefore, before and after correction stand as follows:—

	Per 1,000
St. George's Hospital, gross death-rate	88
London „ „	88
St. George's, 500 medical and 500 surgical cases	92
London „ „	100

Another cause which must obviously influence the mortality of hospitals, by bringing about a greater or less severity in the cases admitted, is the *sex* of the patients. I may premise that, taking one hospital with another, the admissions of male patients are to those of females as about 6 to 4 (or 3 to 2), and the deaths as about 5 to 4. Now, I find that in the three years, 1863, 1864, and 1865, the Royal Free Hospital admitted 2,059 males and 2,018 females, or, very nearly the same number; while, in the same three years, the London Hospital admitted 8,700 males and only 4,219 females; the males,

therefore, being more than twice as numerous as the females. The death-rate, without distinction of sex, was, for the Royal Free 71 per 1,000, for the London Hospital 94 per 1,000. But, if we suppose each hospital to have admitted 500 males and 500 females, the death-rate becomes, for the Royal Free 70, for the London 91. This correction, therefore, makes a difference of 3 per 1,000. The interval is narrowed from 94—71 to 91—70.

I will take one more case of this class. St. George's Hospital, in the four years 1862-65, admitted 8,975 male, and 6,277 female, patients, being about 3 to 2; while the proportion for the London Hospital, for three years, was more than 2 to 1. The aggregate mortality for the London Hospital was 94, for St. George's 88; but for an equal population of 500 males and 500 females, the death-rate at London Hospital becomes 91, and at St. George's 86. Both figures are reduced, but the divergence which was represented by the figure 6 is now represented by the figure 5 (94—88 and 91—86).

A third cause which affects the death-rate of our general hospitals, by modifying the severity of the cases admitted, is the existence or non-existence of special wards, or the existence of special wards for patients more or less strongly contrasted and subject to different rates of mortality. Under this head I will compare the two great hospitals, St. Bartholomew's and Guy's, and for the four years 1861, 1863, 1864, and 1865. In the four years in question, the gross death-rate for Bartholomew's Hospital was 106, for Guy's 95; but after deducting the patients and deaths in their respective special wards, the figures become 121 and 115; a divergence in the one case of 11 per 1,000, in the other of only 6 per 1,000.

I have now illustrated by suitable examples the influence of the distribution of medical and surgical cases, of special wards, and of the varying proportion of males and females, on the gross mortality of our general hospitals; and I will conclude this part of my subject by a single illustration of the relative force of these three modifying agents. I take for this purpose the death-rates of St. Bartholomew's and Guy's Hospitals for the fatal year 1864.

In that year 5,543 patients admitted into St. Bartholomew's sustained a mortality of 617, and 4,989 admitted into Guy's Hospital a loss of 480. The death-rate in the one was 111 per 1,000, in the other 96 per 1,000. But while there were admitted into the special wards of St. Bartholomew's 848 patients, of whom 17 died, there were admitted into the special wards of Guy's 1,026, of whom only 12 died. If now we deduct these admissions into special wards with the corresponding deaths, we have for the general wards of St. Bartholomew's 4,695 admissions and 600 deaths; for the

general wards of Guy's 3,963 admissions and 468 deaths; the death-rate in the one hospital rising from 111 to 128 per 1,000, in the other from 96 to 118. Thus, in consequence of the larger number and lower mortality of cases admitted into the special wards of Guy's Hospital, the death-rates of the two hospitals approach more closely when the cases and deaths in the special wards are deducted.

We have next to inquire to what extent the death-rates of the two hospitals will be modified, if we assume 500 males and 500 females to have been admitted into each of them, and to have been subject to its own special rates of mortality. Now, in the year 1864, the 5,543 patients of St. Bartholomew's Hospital consisted of 3,184 males and 2,359 females, while the 4,989 patients of Guy's Hospital consisted of 3,009 males and 1,980 females. The deaths, in the one case, amounted to 398 males and 219 females; in the other to 316 males and 164 females. The death-rate for St. Bartholomew's was 125 for males and 93 for females; and for Guy's 105 for males and 83 for females: and a population of 500 males and 500 females would, therefore, suffer a mortality of 109 at Bartholomew's and 94 at Guy's. By this adjustment, then, the gross death-rate of St. Bartholomew's falls from 111 to 109 per 1,000; of Guy's from 96 to 94 per 1,000.

Our last inquiry relates to the modifying influence of medical and surgical cases. Now, in the year 1864, the 5,543 patients of St. Bartholomew's consisted of 2,043 medical, and 3,500 surgical, cases; while the 4,989 patients of Guy's Hospital consisted of 1,921 medical, and 3,068 surgical, patients. 401 medical patients and 216 surgical died at St. Bartholomew's; 290 medical, and 190 surgical, patients at Guy's. The death-rate of medical cases was 196 per 1,000 at St. Bartholomew's, and 151 per 1,000 at Guy's; the surgical death-rate 62 per 1,000 in both hospitals. If now we assume a like population of 500 medical, and 500 surgical, patients to have been admitted, in 1864, into both hospitals, the one (St Bartholomew's) would have a death-rate of 129, the other (Guy's) a death-rate of 107 per 1,000. By this adjustment, then, the rate of mortality rises at St. Bartholomew's from 111 to 129 per 1,000; at Guy's from 96 to 107 per 1,000.

The figures of the original mortality of the two hospitals, and of their mortality as modified by abstraction of special wards, by equalisation of males and females, and of medical and surgical cases, are brought together in the following table.

TABLE I.

	Year 1864. Death-rate per 1,000.		
	St. Bartholomew's.	Guy's.	Difference.
Original figures	111	96	15
Same after abstraction of special wards	128	118	10
500 males and 500 females	109	94	15
500 medical and 500 surgical cases	129	107	22

The returns from the several hospitals (as published in our *Journal*), do not comprise any figures which would enable me to ascertain the modifying influence of age; but as this is likely to be considerable, I have had recourse to the books of King's College Hospital, and have abstracted the 1,500 cases which came first to hand, in the year 1864, as inmates of the general wards of the hospital. I have reduced them to the standard of 1,000, distinguished them as males and females, and divided them into two groups, as they were under or over 25 years of age. The results are given in the following table:—

TABLE II.

	Males.		Females.	
	25 and Under.	Above 25.	25 and Under.	Above 25.
Deaths	25	58	18	34
Recoveries, &c.	197	294	191	183
Total admissions	222	352	209	217
Deaths per 1,000	113	165	86	157

The great disparity shown in this table between the death-rate of males under and over 25 years of age, and the still greater disparity in the case of females, shows that this element of age is also one that cannot be disregarded when we compare the mortality of one hospital with that of another.

There is another modifying cause affecting the death-rate of hospitals which may be illustrated by figures. I mean the proportion of free admissions to admissions by letter. The influence of these two modes of admission on the mortality of an hospital may be inferred from the statement that in King's College Hospital, during the years 1863-64, I found the death-rate among 250 recom-

mended patients to be 184 per 1,000, and among the same number of free patients, only 160 per 1,000. Both classes of patients were resident in London and its environs. There is still another cause which may be supposed to affect the death-rate of our hospitals, namely, the mean residence of the patients. But this is rather an index to the class of patients admitted, than a direct and influential cause of mortality. An hospital, for instance, which encourages trivial cases, and keeps its beds full, will have a short mean residence, a low death-rate, and a long list of patients, as necessary results; but the cause of the low mortality is the trivial character of the diseases treated, not the short stay of the patients in hospital. The encouragement of chronic cases of slight severity, would lead to a low death-rate and long mean residence; but here again, the low mortality would result from the nature of the cases, and not from the sojourn in hospital. On the other hand, the admission of cases of extreme severity would entail a high death-rate, with short mean residence, and many patients. But if the cases were somewhat less severe, then the quick death of the few that must die would be set against the slow recovery and lingering convalescence of the larger number that get well, and the result might be a high death-rate and long mean residence. Again, surgical cases, which entail a comparatively low rate of mortality, may necessitate a longer mean residence in hospital. There is, therefore, no such direct relation of cause and effect between residence and death-rate as there has been shown to be between age, sex, and the proportion of medical and surgical cases and the rate of mortality. These natural suggestions are borne out by the numerical returns. The average of surgical mean residences is 34 days; of medical 30. And while St. Bartholomew's and Guy's Hospitals, with surgical death-rates of 61 and 60 respectively, have minimum mean residences for that class of cases of 28 and 31 days; the Royal Free Hospital, with a surgical death-rate of 49, has a mean residence of 21 days. So also with the medical cases. St. Bartholomew's and Guy's Hospitals, with medical death-rates of 182 and 150, have minimum mean residences of 28 and 33 days; while the Royal Free Hospital, with a death-rate of 141, has for its minimum residence 22 days. I may add that of the five hospitals, St. Bartholomew's, Guy's, London, St. George's, and St. Mary's, which have furnished complete returns for five years, and show a higher rate of mortality, general and surgical, than the Royal Free Hospital; none show a lower mean residence than 24 days for medical, 26 for surgical, and 26 for all cases, while the Royal Free Hospital, which has given returns for four years, has a minimum residence for medical cases of 22, for surgical cases of 21, and for all cases of 22 days. The general rule, then, would seem to be, that severe cases and long

mean residences, less severe cases and short mean residences, go together. It is also probable that wealthy endowed hospitals would keep their patients somewhat longer than hospitals supported with difficulty by voluntary contributions; and that the mean residence will also tend to vary inversely as the demands for admission and directly as the number of beds habitually vacant.

Hitherto I have been assuming that, in comparing one hospital with another, the death-rates are those of the same year; but it is well known that, in the absence of figures relating to the same year, it is not an unusual procedure to compare those of different years and to draw inferences from them. In order to show the errors into which such a comparison of different years with each other might lead, and also to supply the necessary data for some other inquiries bearing on the causes of the mortality of hospitals, I have prepared three tables, of which the first displays the general mortality of London for the five years 1861-65, the second the rate of mortality in the medical wards, and the third the rate in the surgical wards. No deduction is made in either of these tables for special wards.

TABLE III.—*General Mortality for the Five Years* 1861-65.

Hospitals.	Deaths per 1,000.					Maximum.	Minimum.	Mean.	Range.	Ditto per Cent.*
	1861.	1862.	1863.	1864.	1865.					
1. St. Bartholomew's	107	112	102	111	102	112	102	107	10	9
2. Guy's	94	96	97	96	93	97	93	95	4	4
3. St. Thomas's	98	97	103	125	101	125	97	103	28	22
4. London	84	76	87	105	89	105	76	88	29	28
5. St. George's	87	85	83	86	97	97	83	88	14	14
6. Westminster	98	103	91	106	92	106	91	98	15	14
7. King's College	107	101	123	151	126	151	101	120	50	33
8. St. Mary's	103	96	98	112	106	112	96	103	16	14
9. Royal Free	67	73	64	74	77	77	64	71	13	17
10. Charing Cross (3 years)	83	87	77	—	—	87	77	82	10	11
11. Metropolitan Free (4 years)	69	56	69	—	56	69	56	63	13	19
12. Great Northern (2 yrs.)	82	45	—	—	—	82	45	66	37	45

Note.—In order to facilitate the study of this and the following tables, the maxima and minima in the columns of the years, are printed in a characteristic type.

* The percentage of this column is that of the range, or difference between the highest and lowest death-rates of the five years, compared with the maximum death-rate.

TABLE IV.—*Rate of Mortality in Medical Cases*, 1861-65.

Hospitals.	Deaths per 1,000.					Maximum.	Minimum.	Mean.	Range.	Ditto per Cent.
	1861.	1862.	1863.	1864.	1865.					
1. St. Bartholomew's	187	191	153	196	180	196	153	182	43	22
2. Guy's	143	146	155	151	155	155	143	150	12	8
3. St. Thomas's	129	125	131	156	127	156	125	132	31	20
4. London	128	104	124	145	139	145	104	127	41	28
5. St. George's	116	117	118	124	138	138	116	123	22	16
6. King's College	145	135	153	196	160	196	135	157	61	31
7. St. Mary's	122	105	129	156	165	165	105	134	60	36
8. Royal Free (4 years)	115	—	126	154	165	165	115	141	50	30
9. Charing Cross (3 years)	117	112	105	—	—	117	105	111	12	10
10. Metropolitan Free (4 years)	79	71	122	—	97	122	71	96	51	42

TABLE V.—*Rate of Mortality in Surgical Cases*, 1861-65.

Hospitals.	Deaths per 1,000.					Maximum.	Minimum.	Mean.	Range.	Ditto per Cent.
	1861.	1862.	1863.	1864.	1865.					
1. St. Bartholomew's	56	63	70	62	55	70	55	61	15	21
2. Guy's	56	61	62	62	58	62	56	60	6	10
3. St. Thomas's	63	75	77	102	82	102	63	77	39	38
4. London	65	64	72	90	70	90	64	72	26	29
5. St. George's	62	65	55	53	64	65	53	60	12	19
6. King's College	80	58	81	93	68	93	58	75	35	38
7. St. Mary's	81	85	67	76	68	85	67	75	18	21
8. Royal Free (4 years)	52	—	45	47	51	52	45	49	7	13
9. Charing Cross (3 years)	53	68	54	—	—	68	53	58	15	22
10. Metropolitan Free (4 years)	57	46	90	—	12*	90	46	66	44	49

* Obviously exceptional.

The first of these three tables (Table III) contains figures which fully illustrate the extent of the error that might arise from comparing different years. In the year 1861, St. Thomas's and Westminster Hospitals had the same rate of mortality (98 per 1,000); but if the death-rate of Westminster Hospital in 1861 were compared with the death-rate of St. Thomas's in 1864, the one would be 98 the other 125 per 1,000. In the same year, St. Bartholomew's and King's College Hospitals had the same death-rate of 107 per 1,000; but if the death-rate of King's College Hospital in 1864 were compared with that of St. Bartholomew's in 1861 the respective death-rates would be 151 and 107. Lastly, in 1865, the death-rates for St. Thomas's and St. Bartholomew's being 101 and 102 respectively, St. Bartholomew's would show a rate of 112 in 1862,

and St. Thomas's of 125 in 1864. It will be seen that, in the second case (that of St. Bartholomew's and King's College Hospitals), it makes a difference of little less than 50 per cent., if, instead of comparing the death-rates of the same year, 1861, we compare St. Bartholomew's in 1861 with King's College in 1864.

An examination of Tables III, IV, and V reveals one or two facts worthy of notice. In the first place, it is obvious that the death-rate is subject, in the same hospital, to considerable fluctuations, even in short terms of years. In the second place, it is evident that the amount of fluctuation varies greatly in different hospitals, both in medical and in surgical cases. In the third place, the highest and lowest death-rates seem to occur in very large proportion in two years, 1864 and 1862 respectively. These facts are patent on the very face of the tables.

The highest *general* death-rate occurs in five hospitals out of the seven which have supplied returns for every year of the quinquennial period (St. Thomas's, London, Westminster, King's College, and St. Mary's) in the year 1864; in another (St. George's) in the following year 1865; in Guy's in 1863; while in St. Bartholomew's, the deaths fall short by one only of the maximum, which occurs exceptionally in 1862. The highest *medical* death-rate occurs also in four hospitals in the same year, 1864—the hospitals being St. Bartholomew's, St. Thomas's, London, and King's College; in two hospitals (St. George's and St. Mary's) it occurs in the following year, 1865; in one (Guy's) in the same year as well as in the previous year, 1863. The highest *surgical* death-rate falls also in four hospitals (Guy's, St. Thomas's, London, and King's College) in the year 1864; in one (St. Bartholomew's) it occurs in the previous year, 1863; in two (St. George's and St. Mary's) in the year 1862. In the case of Guy's Hospital the same figure occurs in 1863 and 1864. On the other hand, the lowest general death-rates of four of the five hospitals which showed a maximum in 1864 (St. Thomas's, London, King's College, and St. Mary's), occur in one year, 1862; and also the lowest medical death-rates. The lowest surgical death-rate falls in two instances in 1861, in two instances in 1862, and in one instance in each of the years 1863, 1864, and 1865. It may be stated, then, in general terms, that the maxima and minima of the general, medical, and surgical death-rates fall, in the great number of instances, in the same years, the minimum surgical death-rate being the single exception to the rule.

Two interesting questions now arise:—do these extreme death-rates coincide with the highest and lowest number of deaths in other public institutions in London, and in the districts in which the hospitals are situate; and, can the excessive mortality of our hospitals in certain years be explained in part by the prevalence

of certain fatal diseases among the general population of the metropolis?

I prepare for the solution of these questions by constructing the following tables, showing the deaths in public institutions, in districts, and by certain fatal maladies.

TABLE VI.—*Deaths in Public Institutions*, 1861-65.

	1861.	1862.	1863.	1864.	1865.	Maximum.	Minimum.	Mean.	Range.	Ditto per Cent.
1. Prisons	46	53	64	125	99	125	46	75	79	63
2. Workhouses	5,757	6,401	6,187	7,055	6,715	7,055	5,757	6,423	1,298	18
3. Military and naval asylums	251	307	289	315	278	315	251	288	64	20
4. Hospitals and asylums for foreigners	58	74	61	82	71	82	58	69	24	29
5. General hospitals	3,234	3,167	3,169	3,558	3,354	3,558	3,167	3,296	391	11
6. Hospitals for special diseases	335	690	827	982	1,002	1,002	335	767	667	66
7. Military and naval hospitals	223	236	203	215	176	236	176	210	60	25
8. Lunatic asylums	276	310	264	327	353	353	264	306	89	25
9. Lying-in hospitals — women	38	35	11	24	26	38	11	27	27	71
Lying-in hospitals — children	58	40	37	48	42	58	37	45	21	36

TABLE VII.—*Deaths in Metropolitan Districts*, 1861-65.

	Deaths per 10,000.					Maximum.	Minimum.	Mean.	Range.	Ditto per Cent.
	1861.	1862.	1863.	1864.	1865.					
West	224	223	232	249	230	249	223	232	26	10
South	228	227	233	254	232	254	227	235	27	10
North	223	220	238	254	245	254	220	236	34	13
Central	250	258	265	293	270	293	250	267	43	15
East	240	260	265	290	264	290	240	264	50	17
London	232	236	245	265	246	265	232	245	33	13
England [000's omitted]	435,	437,	474,	496,	491,	496,	435,	455,	61,	12,

TABLE VIII.—*Deaths by Prevalent Diseases and Classes of Disease*, 1861-65.

	1861.	1862.	1863.	1864.	1865.	Maximum.	Minimum.	Mean.	Range.	Ditto per Cent.
1. Bronchitis	6,465	5,925	6,049	8,666	7,265	8,666	5,925	6,874	2,741	32
2. Respiratory organs	11,735	11,190	11,499	15,201	12,545	15,201	11,190	12,434	4,011	26
3. Phthisis	7,716	7,749	7,991	8,559	8,710	8,710	7,716	8,145	994	11
4. Tubercular diseases	10,824	10,574	11,097	11,735	11,932	11,932	10,574	11,232	1,358	11
5. Diseases of organs of circulation	2,850	2,993	3,116	3,536	3,456	3,536	2,850	3,190	686	19
6. Zymotic diseases	15,710	17,869	21,805	20,051	18,058	21,805	15,710	18,699	6,095	28

Hospitals (medical cases), maximum in 1864 in 4 out of 7.
" " minimum in '62 in 4 " 7.

On comparing the figures in these three tables with those in Tables III, IV, and V, it will be seen that the highest and lowest rates of mortality in the London hospitals bear some relation to the rates in the several London districts, and in the public institutions of the metropolis; as well as to certain diseases and groups of disease to which the greatest number of deaths is attributed in the reports of the Registrar-General. I shall offer a few observations on each of these points under the three heads of districts, public institutions, and diseases.

1. *Districts.*—It will be observed (Table VII) that the highest death-rate in each of the London districts occurs in the year 1864, and the lowest in 1862, or the year preceding. Also (Table III), that in the same year, 1864, the highest death-rate occurs in five hospitals out of nine; and the lowest in the same year, 1862, or the year following, in eight out of nine. The minimum rate falls in 1862, in three districts out of five, and in four hospitals out of nine. But a more direct comparison of hospital with district shows that the hospitals are affected by the rate of mortality occurring in the districts in which they are situate. At St. Mary's Hospital, the highest and lowest death-rates occur in the same years as in the western district; at St. George's Hospital in the year following; while at the Westminster Hospital the highest rate coincides with that of the district, though the lowest takes place in the year following. St. Thomas's Hospital, too, in the south district, has its maximum and minimum death-rates in the same years in which they occur in the district itself, though Guy's Hospital, in the same district, shows a maximum in 1863, and a minimum in 1865. The Royal Free Hospital, in the north district, has its greatest and least death-rates in the year following those of the district itself. The mortality of King's College Hospital follows the rule of the central district as to its maximum rate, while its minimum occurs in the year following the minimum for the district. St. Bartholomew's, however, does not conform to the rule of the district in either extreme. Lastly, the London Hospital, in the east district, had its greatest death-rate in the year of the maximum for the district, and its least death-rate in the year after.

It will be observed that I have given, in each of the tables now under consideration, columns showing the range, or difference between the highest and lowest death-rates, and the percentage of the same in relation to the maximum. Some interesting results follow from an examination and comparison of these figures. Some hospitals, such as Guy's, show a remarkable freedom from fluctuation; while others, such as the London and King's College, display very wide intervals between their extreme death-rates. Thus, the general medical and surgical death-rates, which, in the case of Guy's

Hospital, fluctuate as the numbers 4, 8, and 10, in the case of the London Hospital fluctuate as the figures 28, 28, and 29, and of King's College Hospital as 33, 31, and 38. Now, in this respect also, there is a noteworthy coincidence between hospital and district. Thus Guy's Hospital, which exhibits the curiously low ranges of 4, 8, and 10 per cent., is situate in the south district, which shares with the west the lowest district-fluctuation, namely 10 per cent. St. Thomas's Hospital, which displays a higher rate, is exceptionally circumstanced. The three western hospitals have the higher rate of fluctuation of 14 per cent., the western district, as just stated, having the low rate of 10 per cent. The Royal Free Hospital, with the moderate range of 17 per cent., is in the north district, which has the next higher range of 13 per cent. In the central district, which has the still higher range of 15 per cent., King's College Hospital displays the high range of 33 per cent., though St. Bartholomew's shows much greater steadiness by a range of 9 per cent. Lastly, the east district, which contains the London Hospital, has its high range of 17 per cent., while the hospital itself, with its range of 28 per cent., falls short only of the high fluctuation of King's College Hospital.

It appears, then, that between the highest and lowest death-rates of hospital and district, as between their respective rates of fluctuation, there is such an amount of coincidence as fully justifies the assertion that one element in the mortality of our hospitals is the population by which they are surrounded.

This coincidence between the death-rates of our hospitals and those of the districts surrounding or adjacent, would doubtless be more exact if each hospital drew its supply of patients solely, or chiefly from its own neighbourhood. But this is very far from being the case, and it is quite possible that the proportion which patients from the intermediate neighbourhood bear to those from places more remote, may vary so much in different hospitals as to affect the rate of mortality. That the influence which the local sources of supply exert on the death-rate is very considerable, may be inferred from the following statement of the rates of mortality in the year 1864 for four groups of districts. The figures were obtained by abstracting for each group the first hundred cases and their results, cases brought in dead being omitted :—

	Death-rate per 1,000.
1. Adjacent districts	140
2. Districts more remote	130
3. Environs of London	110
4. Country	30

These figures render it probable that, in the case of the London hospitals, the worst cases are brought in from the immediate neigh-

bourhood, and cases of less severity from parts more remote, while the cases sent from the country have the low death-rate that prevails in some county hospitals which draw their supply of patients from towns of small size, or from the rural districts.*

2. *Public Institutions.*—The nine groups of public institutions (Table VI) display such a general resemblance to our hospitals as to confirm the inferences drawn from the comparison just made of hospital with district. Of the group of general hospitals, it will suffice to observe, that the returns of the aggregate number of deaths show the maxima and minima to fall, as might be expected, in the years 1864 and 1862. Of the eight groups that remain, four have their maximum of deaths in the fatal year 1864, and their minimum in 1861. In two other groups (hospitals for special diseases and lunatic asylums) the maximum is postponed to 1865. The remaining groups follow exceptional orders of their own, perhaps accounted for, in part, in the case of the Lying-in Hospital, by the smallness of the figures.

There is one group of figures in this table (I mean that which exhibits the deaths in the London prisons) which is so remarkable that I propose to offer a few observations upon it in an appendix.

3. *Diseases.*—In Table VIII I have brought together the six diseases and classes of disease which give rise to the greater number of deaths among the adult population, and form the fund out of which the hospitals draw their chief supply of medical cases. The figures represent the number of deaths from those diseases and classes of disease occurring in the metropolis in the five years 1861-65. Now, if we bear in mind the fact that, in the case of our hospitals and of the districts in which they are situate, the highest death-rate, as a broad general rule, occurs in the year 1864, and the lowest in 1862, we shall naturally expect to find, in this table, some disease, or group of diseases, or possibly more than one, which inflicts its greatest and least loss on the community in those same years. Such a disease, and such a group of diseases, is bronchitis, and diseases of the organs of respiration, of which the maxima and minima also occur in the years 1864 and 1862. Diseases of the organs of circulation also exhibit their maximum in 1864, but their minimum in 1861; and these diseases are closely allied to those of the organs of respiration. Tubercular diseases, which have their minimum in 1862, but their maximum in 1865, and phthisis, the principal member of this group, of which the maximum mortality falls one year later, and the minimum one year earlier than the extremes in bronchitis, are sure to play an important part in the

* The returns sent in to the Council from a few provincial hospitals, exhibit for county hospitals a death-rate ranging from 21 to 60 per 1,000, and, for manufacturing towns, 57 to 105 per 1,000.

mortality of hospitals. But zymotic diseases, which form the largest of the six classes contained in the table, have their maximum in 1863, and their minimum in 1861.

If we compare the deaths in public institutions (Table VI) with the deaths by prevalent diseases (Table VIII), we discover some suggestive coincidences. The deaths in special hospitals, which comprise hospitals for phthisis and diseases of the chest, coincide as to maxima and minima with the deaths from phthisis, and deaths in workhouses, military and naval asylums, and hospitals and asylums for foreigners, with diseases of the organs of circulation; with which class of maladies the deaths among the much younger class of prisoners also coincides.

If, again, we refer to Table IV, which exhibits the mortality of our hospitals from medical cases, we find the extremes for St. Thomas's, London, and King's College Hospitals coinciding with the deaths from bronchitis and diseases of the lungs; those of St. George's with the deaths from phthisis; those of St. Mary's with the deaths from tubercular diseases; those of Guy's (which shows the same maximum in 1863 and 1865) either with the deaths from zymotic diseases or with those from phthisis.

It is not consistent with the limited objects of this paper to trace the deaths in our London hospitals to their special causes; but I think there are good grounds for the opinion that pulmonary consumption and bronchitis contribute very largely to the excessive mortality in very fatal years, these diseases being at the same time rife in other public institutions and among the general public, and being chiefly due to the low temperature of the winter months, by which the deaths of persons suffering from consumption are hastened, and fatal bronchitis, both in healthy and unhealthy persons, directly induced. To support this statement it will suffice to give the figures extracted from the records of two hospitals—St. Bartholomew's and King's College. At the first of these hospitals, the mortality among medical cases was at a minimum in 1863, at a maximum in 1864; and in the first of these years phthisis and bronchitis proved fatal to 64 and 28 patients, in the second to 80 and 49. At King's College Hospital, the minimum death-rate took place in 1862, and the maximum in 1864. In the first of these years phthisis destroyed 8 patients, in the second 22, and bronchitis 11 and 16 in the two years respectively. The very high death-rate at King's College Hospital for 1864, was also in part accounted for by an increase in deaths by continued fever from 7 to 15, and by erysipelas and pyæmia from 11 to 16. It is also well worthy of observation, as showing the occasional influence on hospital mortality of transitory external causes, that the deaths following accidents or deeds of violence, which were 9 in 1862, rose to 26 in 1864. This nearly

three-fold increase is believed to have been mainly brought about by the works for the Thames Embankment.

Having now, by a direct appeal to figures, justified the opinion expressed at the beginning of this paper, that "within the limits "of the same capital city, the mortality of hospitals is mainly due "to the causes which determine the nature and severity of the cases "admitted within their walls;" and having also given striking illustrations of the modifying influence of some of those causes, I proceed to gather up into one summary the several causes in question, whether demonstrated in this paper, or obvious on consideration, or noticed by earlier writers;* and to arrange them in order under the distinct heads of—1, causes affecting the applicants for admission; 2, causes influencing the selection of cases; and, 3, causes determining the fate of patients actually admitted.

1. *Causes Affecting the Applicants for Admission.*—Ages, sexes, and occupations of the surrounding and adjacent population. Density of the population, and relation of the same to the size of the hospital. Greater or less proximity of other hospitals and dispensaries. More or less easy access from the rural districts. General repute of the hospital. Neighbourhood of large public or private works, temporary or permanent, as causing an excess of surgical cases. Weather and epidemic constitution of the year, and consequent more or less healthy state of the population.

2. *Causes Influencing the Selection of Cases.*—The proportion of cases admitted with and without the recommendation of governors and subscribers. The admission of patients at all times, or only on certain days and at certain hours: by the medical staff or by the managing committee. The more or less rigid exclusion, by the rules of the hospital, of chronic cases, such as consumption and insanity, and of infectious cases, such as fever and small-pox. The existence or non-existence of special wards, and the character of patients admitted to the same. The proportion of medical and surgical wards or beds, and of wards or beds for males and females. The number of out-patients, as supplying cases that ought to be admitted into the wards. The existence, or otherwise, of a medical school, as supplying a motive to the reception of

* Under this head I desire to call special attention to an excellent paper published by Dr. T. B. Peacock, in the "London Journal of Medicine," No. XLI (May, 1852), p. 431, under the title of "Vital Statistics of the Royal Free Hospital." In this paper the fluctuation in the death-rate from year to year, the influence of age and sex, the relation of the accommodation in the hospital to the needs of the adjacent districts, the mode of admission and the rules of selection of cases, the respective numbers of medical and surgical cases, the length of residence and more or less prompt discharge of chronic cases, are specified as causes effecting the rate of mortality, and more or less deserving of consideration. Some of these causes are illustrated by appropriate numerical comparisons.

instructive and severe cases. The age of the hospital as affecting the number of its supporters, and of the school as determining the extent of its professional connections. The reputation of one or more members of the surgical staff as skilful operators, or of one or more members of the medical staff for the treatment of diseases of a severe and fatal character.

3. The rules and practice of the hospital in respect of the retention of chronic cases. The sanitary arrangements of the hospital. The nursing arrangements. The skill of the hospital staff.

We have here a score at least of well defined causes, or small groups of causes, of which nearly one-half have been shown, by an appeal to figures, to have a decided influence on the death-rate of our hospitals. And, if exception could be taken to any of them, it would probably be to those two in the third group, to which uninformed persons are apt to attach the greatest importance—sanitary arrangements and professional skill. It is true that when we are comparing the rate of mortality of the London hospitals with that of some few of our provincial hospitals, or with some hospitals in other countries, we may be justified in attaching great importance to sanitary arrangements, and, in the case especially of some other countries, to professional skill. But when we limit ourselves to London hospitals, and compare their rates of mortality, we are dealing with institutions which, in all probability, have carried their sanitary arrangements to that point of excellence at which the issue of cases ceases to depend upon, or to be materially influenced by them; and it would be no less invidious than unjust to attribute the differing death-rates of our hospitals, in an appreciable degree, to any difference in the aggregate skill and ability of their professional staff, chosen, as it is, from among those members of the profession who have already given proofs of sound training, ability, and skill in practice. Even in the case of the greatest contrast which two hospital staffs are likely to offer, to wit, a difference of age, the experience and caution of the older physician would be set off against the more recent education and bolder practice of the younger; while the older surgeon, conscious of the drawbacks of age, would cease to court the more hazardous class of operations, and, gradually losing his reputation for quickness of eye and steadiness of hand, would come to deal with a class of cases subject to a lower rate of mortality. So that it is quite conceivable that the diminished skill and efficiency of a hospital staff might lessen rather than increase the rate of mortality; and further, that a low death-rate in an established hospital in such a capital as London, so far from redounding to the credit of its staff, would furnish the strongest reason to believe that they, or the governing body, encouraged the admission of the less serious class of cases,

and that the public had become aware of the fact, and acted accordingly. On the other hand, a high rate of mortality occurring in a London hospital, would afford a presumption that the institution was encouraging by its rules and practice the admission of medical cases of great severity, and surgical cases requiring difficult and hazardous operations.

If this communication had not already occupied more space than I at first expected; if the subject had not grown so much under my hands, I should have offered to the members of the Society who are not medical men, some general observations on the many causes that contribute to bring about the numerical results with which the statist has to deal. I should like to have shown that the prevalence of pauperism and crime, the proportion of the instructed and uninstructed, the prices of commodities, and many other conditions admitting of numerical expression, like the mortality of hospitals, are the results of many causes acting together in every possible combination and permutation of intensity; that this consideration ought to inspire us with caution in comparing one district or country with another, and lead us to view with misgiving, if not with distrust, those explanations which commend themselves to the uninstructed by the single merit of simplicity.

APPENDIX.

Mortality in the London Prisons.

I reserved this subject for special consideration on account of the very remarkable increase which took place in the number of deaths in the London prisons in the year 1864. The figures in Table VI show that the deaths in this fatal year were nearly twice as numerous as in the year preceding; and that, with the exception of the small group of women in lying-in hospitals, there is no other instance of so considerable an increase. Nor do the figures in any other table display a like phenomenon.

It is also observable that the percentage difference between the highest and lowest numbers is unusually large, being for prisons 63, for hospitals for special diseases 66, and for lying-in women in hospital 71. The highest figures for any general hospitals are, for all cases 33, for medical cases 36, and for surgical cases 38 per cent., while the highest for any London district is 17, and for any disease, or group of diseases, 32 per cent. So that there is a greater proportional difference between the lowest and highest mortality of prisoners in the five years 1861-65, than between the lowest and highest mortality of any hospital, district, or group of public institutions, except hospitals for special diseases, and for lying-in women.

Before proceeding further with this inquiry, I will show by figures taken from successive "summaries of weekly returns" issued by the Registrar-General, what has been the annual mortality in London prisons since the year 1850. The figures for the seventeen years from 1850 to 1866 inclusive, are as follows:—

(Cholera.)														(Cholera.)	
1850.	'51.	'52.	'53.	1854.	'55.	'56.	'57.	'58.	1859.	'60.	'61.	'52.	'63.	1864.	'65. 1866.
68,	70,	105,	106,	155,	71,	81,	71,	57,	40,	41,	46,	53,	64,	125,	99, 95.

From these figures it appears that no such sudden increase in the number of deaths as took place in 1864 has occurred in the long period of seventeen years; for from 1850 to 1854, when the high figure, 155, was attained, the increase was more gradual, and did not, in any one year, approach the double of the year preceding. The interval from 1859 to 1864, resembles that from 1850 to 1854 in displaying a progressive increase in the number of deaths, but while in the year 1855 the deaths fell below the half of the year previous, they remained at a high level in the years 1865 and 1866.

The facts, then, which deserve attention in respect of the deaths in our London prisons, are the progressive increase in their number from the low figure of 40 in 1859, to the higher figure of 64 in 1863, the sudden increase to 125 deaths in 1864, and their continuing at the high levels of 99 and 95 respectively in 1865 and 1866.

The question now arises, are there any such coincidences between these figures which represent the deaths in our London prisons, and those which exhibit the deaths in other public institutions in

London, as may enable us to infer the cause or causes of this excessive mortality?

In answering this question, it will be necessary to restrict ourselves to the five years 1861-65, to which all the tables of this paper refer, especially as the exceptional cholera year, 1866, would introduce a foreign element hostile to a just comparison. Now, on referring to Table VI, it will be seen that there are three other groups of institutions (workhouses, military and naval asylums, and hospitals and asylums for foreigners) which coincide with London prisons in displaying a minimum mortality in 1861 and a maximum in 1864, as well as an increase, more or less considerable, in the deaths this last year over those of 1863. These institutions, it will be observed, are either wholly devoted to the reception of aged persons, or they have a population containing this class of people in large proportion. Hence, if we may assume, as I think we can, that these numerical coincidences are not accidental, we must look for an explanation of the high prison mortality of 1864 to some cause or causes which would affect alike the aged inmates of the three groups of institutions, and the young adults of our prison population. Now, the only causes of mortality which would be likely to fulfil this condition, are diseases of the respiratory organs, taking the shape of pulmonary consumption in prisoners, and of bronchitis in the aged inmates of our asylums;—diseases which have been already shown to exert a marked influence on the mortality of our hospitals. These diseases, as will be seen by referring to Table VIII, are at their maximum mortality in 1864, and at a very high figure in the year following; in which points they resemble the mortality among prisoners and the inmates of asylums; but the minimum is seen to occur one year later, and in this they differ. In the case of pulmonary consumption, the minimum mortality falls in the year 1861 with the minimum for prisons, but the maximum is postponed till 1865. But the increase of deaths from consumption in 1864 is very considerable. Diseases of the organs of circulation conform, both in maximum and minimum, to the rule of mortality in prisons and asylums, and though they are comparatively small in number, they probably contribute much to the deaths among the aged, and something to the deaths among prisoners.

It is obvious, then, both from what has been said in the body of this paper, and from the comparisons just instituted, that between the highest and lowest mortality of our London prisons, and the highest and lowest mortality occasioned by diseases of the organs of respiration and circulation, there is such a degree of coincidence as will justify further inquiry; and as diseases of the chest are known to prevail during the last months of one year and the first of the following, additional information will probably be obtained if we group the first and last two years of the quinquennial period in pairs, leaving out the central year, 1863, as one that very rarely presents, in any of the tables, either a maximum or a minimum death-rate. The following table presents, for districts, public institutions and prevalent diseases, the deaths for the two years 1861-62, in contrast with those for 1864-65; together with the excess of the

second over the first, and the proportion per cent. which this excess bears to the larger number. Some of the figures in this table are not necessary to the solution of the question I am now discussing, but they may be useful as presenting a complete view of the deaths in public institutions and their relations to the general mortality of London.

	Deaths per 10,000.			Excess per Cent.
	1861-62.	1864-65.	Excess.	
Districts—				
West	447	479	32	7
South	455	486	31	6
North	443	499	56	11
Central	508	563	55	10
East	500	554	54	10
London	468	511	43	8
England [000's omitted]	872,	987,	115,	12
	Number of Deaths.			
Public Institutions—				
1. Prisons	99	224	125	56
2. Workhouses	12,158	13,770	1,612	12
3. Military and naval asylums	558	593	35	6
4. Hospitals and asylums for foreigners	132	153	21	14
5. General hospitals	6,401	6,912	511	7
6. Hospitals for special diseases	1,025	1,984	959	48
7. Hospitals for consumption and diseases of the chest*	310	392	82	21
8. Lunatic asylums	586	680	94	14
Diseases and Classes of Disease—				
Bronchitis	12,390	15,931	3,541	22
Respiratory organs	22,925	27,746	4,821	17
Phthisis	15,465	17,269	1,804	10
Tubercular diseases	21,398	23,667	2,269	9
Diseases of the organs of circulation	5,843	6,992	1,149	16
Zymotic diseases	33,579	38,109	4,530	12

* This group of public institutions is not to be found in Table VIII.

Note.—Military and naval hospitals and hospitals for lying-in women are omitted, as not conforming to the rule.

This table, while it confirms the conclusions arrived at in the body of this paper by showing that there is a certain relation between the death-rate in the districts of London, London itself, and the kingdom at large, the public institutions of the metropolis, and the most prevalent diseases, brings out into strong relief the great fluctuation in the mortality of our prisons, and connects it with similar fluctuation in hospitals for special diseases, also, in a less degree, with the hospitals for consumption and diseases of the chest, with the disease bronchitis, and with the two leading groups of disease—affections of the lungs and of the organs of circulation.

These facts, then, may be taken to be sufficiently established:—

1. That there is a very great difference between the highest and lowest number of deaths in the London prisons, whether we compare 1861 with 1864, or 1861-62 with 1864-65.

2. That no such sudden increase in the number of deaths as occurred in London prisons in 1864, took place in those institutions in the seventeen years 1850 to 1866, though the deaths recorded in the cholera year, 1854, were more numerous.

3. That the high prison mortality of 1864 was the climax of an unbroken increase in the number of deaths from the year 1859, when they were at their minimum.

4. That the number of deaths in the years 1865 and 1866, though less than in 1864, were still maintained at a high level.

5. That the figures contained in Tables VI and VIII, and in the table just given, justify the opinion that the sudden increase of deaths in 1864, and the large death-rates of 1865-66, may be chiefly due to the prevalence of one or more diseases of the lungs.

6. That as in the case of hospitals and asylums for the aged, the disease of the lungs which occasions the high mortality of certain years, is most probably bronchitis, so in the case of the younger population of prisons, is pulmonary consumption the most probable cause of the excess.

If this opinion be well founded, it ought to be possible to prove—

1. That, in seasons of unusual severity, deaths from pulmonary consumption undergo a sudden and marked increase; 2, that the year 1864, and, in a less degree, the years following, were seasons of exceptional severity; and 3, that pulmonary consumption prevails among prisoners to such an extent, and with such considerable fluctuations, as to explain, at least in part, such differences as those which mark the years 1863 and 1864.

1. That no doubt may exist as to the influence of seasons of unusual severity in increasing the deaths by consumption and other diseases of the lungs, I will adduce certain conclusive numerical statements of the Registrar-General. Between ten cold and ten warm days in the months of November and December, 1856, there was a difference of about 20° Fahr., and the deaths from the diseases in question increased as follows:—

	Ten Warm Days.	Ten Cold Days.	Percentage Increase of Deaths.
Pulmonary consumption	163	232	42
Bronchitis and other diseases of the lungs	394	502	27

2. The unusual severity of the winters of the last three years, and its relation to the increased mortality, are clearly shown by the following extracts from the Registrar-General's summaries of the weekly returns for the years 1864, 1865, and 1866. Of the first of these years the Registrar-General, writing in 1865, says, "The "death-rate was not so high as it was last year in any of the pre- "ceding twenty-four years, except 1847, the influenza year," "and "1849 and 1854, the two cholera years." "The mean temperature "of the air was below the average of twenty-three years in seven

"months out of the twelve." The mean temperature for the whole year, 1863, was 50°·3, and for 1864, 48°·5. "Bronchitis caused "8,666 deaths against 6,049 the previous year." Phthisis, as will be seen in Table VIII, destroyed 7,991 in 1863, and 8,559 in 1864. The summary for 1865 has the following passages:—"The seasons "of the year 1865 were in many respects remarkable. The winter "was cold." "The mean temperature of each of the first three "months lay between 36° and 37°. The mean night temperature "of those months was below or little above the freezing point of "water; bronchitis was unusually fatal; and the rate of mortality "in the coldest weeks of January and February rose a fourth "above the annual average." The deaths by phthisis experienced a further increase from 8,559 to 8,710. Lastly, the summary for 1866 speaks of the mortality of London as being "above the aver- "age in nearly all, except the west and the south districts;" while the quarterly return ending March, 1866, speaks of "the weather "in the quarter" as "unfavourable to health, and by exciting or "aggravating pulmonary diseases, carrying off many persons of "advanced age." In this year bronchitis, which had fallen from 8,666 in 1864 to 7,265 in 1865, rose to 7,512; but phthisis continued to show a progressive increase. It destroyed 7,648 in 1860, 7,716 in 1861, 7,749 in 1862, 7,991 in 1863, 8,559 in 1864, 8,710 in 1865, and 9,277 in 1866.

3. In proof of the great part played by consumption in bringing about fluctuations in prison mortality, I will refer to a paper on the rate of mortality among convicts,* in which the deaths in all the convict prisons are given for the five years 1857 to 1861. In that paper it is shown that the deaths from pulmonary consumption among male prisoners, which were 27 in 1857 and again in 1859, rose in 1858 to 51, or nearly the double of the previous year. The exact value of this fact, as bearing on the present inquiry, will be best seen from the annexed tabular statement:—

	1857.			1858.			Per-centage Increase.
	Males.	Females.	Males and Females.	Males.	Females.	Males and Females.	
Deaths by consumption	27	6	33	51	10	61	85
Pardons on ground of same	1	2	3	4	3	7	—
Total	28	8	36	55	13	68	89
Deaths by other diseases	36	8	44	53	8	71	61
Pardons on ground of same	2	—	2	1	1	2	—
Total	38	8	46	54	9	73	59
Grand total	66	16	82	109	22	141	72

* "On some Results of a Recent Census of the Population of the Convict

From these figures we learn that pulmonary consumption is a disease which prevails to a remarkable extent among our convicts—to such an extent as to account for 44 to 48 per cent. of all the deaths—that the number of its victims may be increased nearly twofold from one year to another, and that, when compared with other causes of death, it is subject to a much more considerable fluctuation, as measured by the numbers 85 or 89, compared with the figures 61 or 59.

Though these figures relate primarily to the convict prisons taken collectively, they doubtless admit of application to the prisons of London, and when taken with the preceding statement, and the facts established in the body of this paper, render it in the highest degree probable that the curious increase of deaths in prisons in 1864, and the high mortality of the two years following, is due in great part to consumption, hastened in its attack, and rendered speedily fatal by the exceptional severity of the season in the years under consideration.

If such an increase of deaths by consumption may take place in our London prisons, where their inmates are so largely protected from the weather, it is easy to understand how at public works, where a considerable exposure to the weather is unavoidable, consumption and diseases of the lungs may come to prevail to an extent to alarm the authorities, and, in the absence of such information as this paper contains, to lead even medical men to attribute the result to the last change, dietetic or otherwise, which may happen to have been made. We have only to suppose this partial and inaccurate view of the case to be submitted to an English jury, and a verdict to be returned in accordance with the evidence, to be able to forecast the consequences. The opinion of the jury, though utterly valueless in a question of medical science, carries with it such undue weight, that no expense will be spared by the authorities to carry its recommendations into effect; and thus it is that the money of the public is wasted, and the public burdens unnecessarily increased. Let me, by way of conclusion, insist on the great value of those statistical records and researches which, when rightly used, minister not less to State efficiency and economy than to truth.

" Prisons in England; and especially on the Rate of Mortality at present Prevail-
" ing among Convicts." By W. A. Guy, M.B., Medical Superintendent of Mill-
bank Prison.—" Transactions of the National Association for the Promotion of
" Social Science, 1862," p. 561.

NOTE *on the Rate of Mortality at St. Thomas's Hospital during the last Nine Years.*

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In the year 1862, in consequence of the site of the old hospital being required for railway purposes, the establishment was removed to the present temporary building at Newington. At present the accommodation is much more limited than in the old hospital, so that the number of patients under treatment since the removal has been much less than before, and the rate of mortality in the cases under treatment has considerably increased. The annexed table shows the number of patients discharged, died, and under treatment, during two periods of four years each—the first terminating on the 31st of December, 1861, the second at the same date of 1866—the year 1862 being excluded from calculation, as being that in which the removal took place. From this table it will be seen, that, while the patients under treatment amounted during the first period to a total of 16,258 (or to an annual average of 4,064), and the mean number resident to 437; in the second period the number of patients was only 7,600 (or a yearly average of 1,900), and the number resident was reduced to 189. It will further be seen that the rate of mortality was very considerably higher among the smaller number of patients of the second period than in the larger number of the first period. Thus, during the first period the total number of deaths amounted to 1,433, and the rate of mortality was consequently 8·81 per cent.; while, in the second period, the deaths were 850, and the rate of mortality 11·18 per cent.—a difference of not less than 2·37 per cent. Nor can this change be regarded as a mere temporary or accidental variation, for the rate was uniformly lower in each year of the first period, and higher in each year of the second period, ranging in the former from 8·18 to 9·7 per cent., and in the latter from 10·25 to 13·1 per cent. I proceed to inquire to what cause this increased rate is to be ascribed.

1. It has been shown by Dr. Guy and other statisticians, that the rate of mortality is usually greater in medical than in surgical cases; and thus that the rate will vary in different hospitals according to the variation in the proportions of the several classes of cases which they contain. It will, however, be found from the table that there is only a slight difference between the proportion of the medical and surgical cases under treatment during the two periods; thus, in the first the medical cases constituted 48·7 per cent., and the surgical 51·2; while in the same period the numbers were respectively 45·6 and 54·3; the slight difference which existed tending rather, according to the ordinary rule, to the reduction of the rate in the second period.

2. It has also been shown that the rate of mortality is ordinarily

less in females than in males; and, consequently, that the proportion of the sexes will affect the rates in hospitals. The rate at St. Thomas's cannot, however, have been much affected by this cause in the periods compared, for the proportion of the sexes is nearly identical. In the first period it will be observed that 59·6 per cent. were males and 40·3 per cent. females; while in the second period the numbers were 59·4 and 40·5 respectively.

3. The ages of the patients under treatment might also affect the rate of mortality, the rate being higher according as the mean age is higher. How far this cause may have been influential in modifying the rates of the two periods I am unable to say with certainty; for a complete comparison could only be instituted after an enumeration of the ages of the patients under treatment in both periods; but there is no reason to suppose that in this respect the two sets of cases differed materially.

4. The period of residence of the patients in the hospital might also affect the rate of mortality; for if two hospitals, or the same hospital at two different periods, admitted equal numbers of fatal diseases, such as consumption or malignant diseases, and one hospital, or the same hospital, at one period retained the patients for a longer period than the other, or at another period, the number of such cases dying in the wards would necessarily be greater. It does not, however, appear that this cause was influential in modifying the rates of mortality at St. Thomas's, the duration of residence of the two sets of cases being nearly the same; thus, in the first period the patients were retained on an average 39·2 days, and in the second 36·3 days.

5. It may further be supposed that some unfavourable alteration may have taken place in the management of the hospital at the time of the removal, or that the sanitary state of the temporary building may be less satisfactory than was that of the old hospital. There is, however, no reason to suppose that this is the case. The staff of the hospital remains nearly the same as it was when the patients were fewer in number, and the patients might therefore be supposed to receive greater care and attention in the new hospital. The temporary building is also better placed than the old hospital. It is situated in a much less crowded neighbourhood, and is surrounded by a garden of fully fourteen acres in extent. The wards are large and high, and the amount of space is ample, being in the accident-ward not less than 1,500 cubic feet, and in the other two wards between 2,000 and 3,000 feet. The whole space occupied by the old hospital did not exceed four acres. The wards in the more ancient parts of the building had only a cubic space of 500 to 800 or 1,100 feet, and in the new building of 1,600 feet, and the neighbourhood was much crowded. It is true that the under drainage of the present site is defective, and the ground is consequently damp and cold; and the hospital has been by no means free from erysipelas, hospital sore, and other diseases resulting from impure air, but such diseases occurred also in the old hospital, and the rate of mortality has probably not been materially increased by this cause.

6. It does not, therefore, appear that any of the circumstances named are sufficient to explain the increase in the rate of mortality

of the hospital since its removal; and the only causes to which the change can be assigned are the increased severity of the cases under treatment, the smaller proportion of trivial cases received, and the exclusion of certain classes of cases of which the rate of mortality is low.

On referring to the table, it will be seen that the rates varied in each class of cases, medical and surgical, and in the two sexes; and (as might naturally be supposed) these variations are most marked in the second or smaller series of cases, the increase in the rate being considerable in all the classes. Thus, the mortality among the medical cases was in the first period 12·52, in the second 14·42. In the surgical cases, in the first period, the rate was 5·28, in the second 8·46. In males, the rate in the first period was 9·53, in the second 10·89. In females, in the first period 7·75, in the second 11·6. This general increase certainly points to increased severity in the cases treated, and is in accordance with personal observation of the practice of the hospital before and since the removal. The old hospital had accommodation for 500 patients, and was in close proximity to another hospital admitting a similar or larger number, and it received many persons from distant localities, causes all of which tended to lessen the number of cases of acute and severe disease, and to increase the proportion of chronic and trivial cases admitted into the hospital. In the temporary hospital there are only accommodation for 213 patients; it is situated upwards of a mile and a-half from any other hospital, and it receives its supply of patients chiefly from the adjacent parts of the town, and thus the cases admitted are generally of a more acute and serious character. At present also venereal and other cases, of which the rate of mortality is almost nil, are not received into the hospital, though a considerable number of such cases were admitted into the old hospital; and this, doubtless is a chief cause of the increased rate of mortality in surgical cases, and especially among females, which is very noticeable in the table. The proportion of venereal cases admitted was much larger in the old hospital in females than in males.

These considerations all tend to confirm the inference that the higher rate of mortality which has obtained at St. Thomas's Hospital of late years is due to the greater severity of the cases admitted, and they are in accordance with the conclusion arrived at by Dr. Guy, that "within the limits of the same capital city, the "mortality of hospitals is mainly due to causes which determine "the nature and severity of the cases admitted within their walls," and still further illustrate his remarks on the caution which should be exercised in drawing inferences as to the efficiency of different hospitals from the rates of mortality which may obtain in them either generally or during particular periods.

St. Thomas's Hostital:—*Summary of Patients Discharged, Died, and Under Treatment in Two Periods of Four Years each, the first ending 31st December*, 1861, *the second 31st December*, 1866.

	First Period.	Second Period.
Patients under treatment	16,285	7,600
Deaths	1,433	850
Mortality per cent.	8·81	11·18
Males	9,704	4,516
Deaths	924	492
Mortality per cent.	9·53	10·89
Females	6,554	3,084
Deaths	509	358
Mortality per cent.	7·75	11·6
Proportion of males	59·6	59·4
„ females	40·3	40·5
Medical cases	7,928	3,467
Deaths	993	500
Mortality per cent.	12·52	14·42
Surgical cases	8,330	4,133
Deaths	440	350
Mortality per cent.	5·28	8·46
Proportion of medical cases	48·7	45·6
„ surgical „	51·2	54·3
Mean numbers resident	437	189
„ period of residence (days)	39·2	36·3